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TITLE: SYSTEM FOR ALLOTING BUSINESS FORM OR THE LIKE
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ABSTRACT:

PURPOSE: To reduce manual operation by performing automatic allotment in accordance with allotting types in the units of business forms through the use of printing information of a segment key showing the destination of the business form to be printed.

CONSTITUTION: An allotting destination address and the type of an allotting method are recognized by the matching of a value in the segment key area and an index key file (1) by using the segment key showing the destination of the business form to be printed, and the business form to be the object for allotment is segmented. An allotting means 9 performs automatic allotment in

accordance with the allotting type in the units of business forms by using an applied program outputted to a standard system out spool 7 without generating the private allotting applied program to respective allotting types. Thus, the manual operation required for allotting operation can be reduced.

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⑭ 発明の名称 帳票類配信方式

⑰ 特 願 昭63-70093

⑱ 出 願 昭63(1988)3月24日

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明 細 書

1. 発明の名称

帳票類配信方式

2. 特許請求の範囲

配信対象となる帳票上のキーフィールド位置を定義するキーフォーマット定義手段と、帳票上のキーを定義する帳票形式定義を記憶したキーフォーマットライブラリ、及びキーと配信先アドレス及び配信タイプとの対応関係を示す索引キーファイルと、配信対象となる帳票出力情報を格納するシステムアウトスプールと、上記キーフォーマット定義手段の定義に従うキーフィールド位置のキー値を上記システムアウトスプール内の帳票出力情報から取出し、同取出したキー値に従い、上記帳票形式定義及び索引キーファイルを参照して、配信先アドレス及び配信タイプを認識する手段と、上記配信先アドレス及び配信タイプと上記システムアウトスプール内の帳票出力情報取出しアドレスとが対応付けて登録される配信管理テーブルと、同配信管理テーブルの内容に従い上記システムア

ウトスプールから帳票出力情報を取出し配信する配信手段とを具備してなることを特徴とする帳票類配信方式。

3. 発明の詳細な説明

〔発明の目的〕

(産業上の利用分野)

本発明は、帳票類を配信タイプに従い自動配信する帳票類配信方式に係るもので、特に、印刷される帳票の配達先を示す区分キーに着目し、この区分キー領域の値(文字列)とキーファイルのマッチングにより配信先アドレス(例えば電話番号)と配信方法のタイプ(例えばG3ファクシミリ、G4ファクシミリ、電子メール、プリントサーバ、プリンタ等)を認識して配信対象となる帳票類を区分し、帳票単位で配信タイプに従った自動配信を行なう配信システムを実現した帳票類配信方式に関する。

(従来の技術)

従来、バッチ処理で作成される帳票は、第3図に示すように、レポート単位に(通常、複数ペ

ージから成る)プリンタへ出力され、プリンタアウトされた帳票上の所定位置に記入された配達先を手により認識し区分して、各宛先別に配達していた。

即ち、印刷される帳票には、配達先を示す区分キーが帳票上の予め定められた印刷位置に文字として印刷してあり、人間がその区分を見て印刷出力された帳票の配達先を区分していた。

又、応用プログラムからファクシミリ等へ自動配信をするためには、標準的なシステムアウトスプールを使わず、ファクシミリ送信用の専用プログラムを使わなければならない。

(発明が解決しようとする課題)

上述したように従来では、プリンタアウトされた帳票の配達先を手による作業で認識し区分していたため、各種帳票の配送作業に多くの時間と労力を要していた。

本発明は上記実情に鑑みなされたもので、印刷される帳票には、配達先を示す区分キーが帳票上の予め定められた印刷位置に文字として印刷され

ることに着目し、上記区分キーの印刷情報を有効に用いることによって、人手を要せず、帳票単位で配信タイプに従った自動配信を行なうことのできる帳票類配信方式を提供することを目的とする。

[発明の構成]

(課題を解決するための手段)

本発明は、印刷される帳票の配達先を示す区分キーに着目し、この区分キー領域の値(文字列)とキーファイルのマッチングにより配信先アドレス(例えば電話番号)と配信方法のタイプ(例えばG3ファクシミリ、G4ファクシミリ、電子メール、プリントサーバ、プリンタ等)を認識して配信対象となる帳票類を区分し、帳票単位で配信タイプに従った自動配信を行なう配信システムを実現したもので、帳票ページ上のキー(見出し)フィールド位置を定義するキーフォーマット定義手段、及びキーの値と配信先及び配信タイプを対応付ける索引キーファイルと、応用プログラムに従う帳票出力情報(システムアウトファイル)を格納するシステムアウトスプールと、複数の配信

タイプ毎の配信先キュー(待ち行列)を持ち、配信先キューは配信先アドレスと上記システムアウトスプール内の帳票レコード(帳票出力情報)のアドレスを示す帳票IDとレコード数のリストからなる配信管理テーブルと、上記システムアウトスプール内の帳票レコードの中から上記帳票形式定義に従ってキューを取り出し、上記索引キーファイル中からその値に一致するレコードを検索し、配信タイプから上記配信管理テーブル内のキューを決定し、配信先アドレスをそのキューに登録する帳票分配手段と、配信タイプ毎に設けられて、そのタイプのキューから配信先アドレスを取り出し、上記帳票IDに従い上記システムアウトスプールから帳票データを取り出して、配信タイプに従ったデータ変換を行なった後、配信先アドレスが示す装置にデータを転送する配信手段とを有してなる構成としている。

(作用)

上記帳票形式定義の行、列位置と桁数に従い、該当する印刷行レコードからキー値を取り出し、

そのキー値を用いて上記索引キーファイルを検索し、一致するキーを持つレコードから配信タイプと配信先アドレスを取り出す。この際、該当する索引レコードがない場合には、既定値の配信タイプと配信先アドレスを取出す。そして配信タイプが一致するキューを上記配信管理テーブルより選択し、同テーブルの配信先キューに配信先アドレスを登録すると共に、システムアウトスプールに格納した帳票レコード群(ページ単位の帳票データ)のファイル内の先頭アドレスとレコード数を帳票IDフィールドにセットする。上記索引キーファイルより、配信タイプ毎に、その配信先キューから配信先アドレスを取り出し、配信する帳票レコードを上記システムアウトファイルから読み出して配信タイプに合わせたデータ形式変換を行なった後、配信タイプによる伝送手段によって帳票データを配信先アドレスの装置に伝送する。

このような帳票類配信手段により、各配信タイプに専用の配信用応用プログラムを作ることなく、標準のシステムアウトスプールへ出力している応

用プログラムをそのまま用いて各種配信タイプの装置へ帳票類を自動配信でき、これにより配信作業にかかる人手を大巾に削減できる。又、帳票をプリンタに印字している既存のプログラムの出力がそのまま自動配信の対象となることから、特定の配信印刷手段を意識する必要がない。

(実施例)

以下図面を参照して本発明の一実施例を説明する。

第1図は本発明の一実施例によるシステム構成を示すブロック図、第2図は上記実施例に於ける、帳票上の領域を定義するキーフォーマット及びキー値と、配信先のアドレス及び配信タイプを対応付けるキーファイル形式とを示す図である。

図中、1は帳票データを作成する応用プログラム、2は帳票形式を指定するジョブ制御言語(JCL)又はコマンドであり、以下帳票形式指定手段と称す。

3はシステム出力手段であり、応用プログラム1からのプリンタ出力データをシステムアウトス

プである。このうち、10は帳票識別名であり、指定された帳票形式定義を一意に識別する。11はキーファイル名であり、帳票形式定義に対応する索引キーファイルの識別をする。12は行位置であり、キーの帳票上の行位置(r)を指定する。13はカラム位置であり、キーの帳票上のカラム位置(c)を指定する。14は長さであり、キーの桁数(s)を指定する。

15乃至18はそれぞれ索引キーファイル6の構成要素である。このうち、15は索引キーレコードであり、索引キー16と配信先アドレス17及び配信タイプ18からなる。16は索引キーであり、配信先を識別する。17は配信先アドレスであり、配信先の端末装置等のアドレスである。18は配信タイプであり、配信手段を示す。

19は印刷帳票形式である。20は帳票形式定義であり、帳票上のキーを定義する。

ここで上記第1図及び第2図を参照して本発明の一実施例に於ける動作を説明する。

帳票分配手段4は、帳票形式指定手段2により

プール7へ格納する。

4は帳票分配手段であり、キーフォーマットライブラリ5に記憶された帳票形式定義20に従って帳票上のキー値から索引キーを引き、配信先を決定する。

5はキーフォーマットライブラリであり、帳票形式定義20を記憶する。6は索引キーファイルであり、索引キーと対応する配信アドレスとタイプのリストである。

7はシステムアウトスプールであり、帳票レコードを格納する。

8は配信管理テーブルであり、配信タイプ別の配信先アドレスのキューと、配信先アドレスに対する配信帳票のレコード識別を記憶する。

9は配信手段であり、配信タイプのキューから配信先アドレスと配信レコードを取り出し、配信先の装置(例えばプリンタ、端末等)へ帳票データを転送する。

10乃至14はそれぞれ上記キーフォーマットライブラリ5に記憶された帳票形式定義20の構成要素

指定された帳票と一致する帳票識別名10を持つ帳票形式定義20をキーフォーマットライブラリ5から読み出す。

応用プログラム1は帳票印刷レコードをシステム出力手段3を経由してシステムアウトスプール7へ記憶する。

帳票分配手段4は、上記帳票印刷レコードの改行情報から帳票の行カウントを行ない、帳票形式定義20の行位置12と一致する帳票レコードの行データ内のカラム位置13で示す桁より、桁数14で示される長さ分のデータ(即ちキー値)を取り出し、帳票形式定義20のキーの順序に配列する。1帳票が終わる(改ページになる)と、その帳票を構成する帳票レコードのシステムアウトスプール7上の格納位置と、レコード数を保持し、印刷帳票形式19の帳票から取り出したキー値で索引キーファイル6を検索し、索引キーレコード15のキー16と一致する索引レコードを読み出し、対応する配信先アドレス17と配信タイプ18を取り出す。

この際、印刷帳票形式19から取り出したキー値

が空白の場合は、現在の配信タイプと配信アドレスをそのまま使用する。又、キー値と一致する索引レコード15がない場合には既定値の配信タイプ1を選択する。

そして配信タイプに一致する配信管理テーブル8内のキューに配信先アドレスを登録し、更に保持したシステムアウトスプール7上の帳票レコード格納位置とレコード数を帳票IDに記憶させる。

一方、配信タイプ毎に用意された配信手段9は、配信管理テーブル8上のそのタイプのキューから配信アドレスと対応する帳票IDを順次取り出し、帳票IDに記憶されているシステムアウトスプール7上の帳票レコードの位置からレコード数だけ帳票レコードを読み出し、配信タイプ毎に決められたデータ変換を行なう。例えば、配信タイプがG3ファクシミリの場合には、帳票レコードをイメージ化し、帳票イメージデータに変換する。また、配信タイプがローカルプリンタであればデータ変換を行なわない。データ変換が終わると、変換されたデータは、配信タイプ毎に決められた送

信手段を使用して、配信アドレスの示す端末または装置に転送される。1つの配信アドレスに対する帳票データの転送が終わると、キュー及びシステムスプールからその帳票を削除し、次のキューを取り出す。

このような帳票類配信手段により、各配信タイプに専用の配信用応用プログラムを作ることなく、標準のシステムアウトスプールへ出力している応用プログラムをそのまま用いて各種配信タイプの装置へ帳票類を自動配信でき、配信作業にかかる人手を大巾に削減できる。又、帳票をプリンタに印字している既存のプログラムの出力がそのまま自動配信の対象となることから、特定の配信印刷手段を意識する必要がない。

〔発明の効果〕

以上詳記したように本発明の帳票類配信方式によれば、配信対象となる帳票上のキーフィールド位置を定義するキーフォーマット定義手段と、帳票上のキーを定義する帳票形式定義を記憶したキーフォーマットライブラリ、及びキーと配信先

アドレス及び配信タイプとの対応関係を示す索引キーファイルと、配信対象となる帳票出力情報を格納するシステムアウトスプールと、上記キーフォーマット定義手段の定義に従うキーフィールド位置のキー値を上記システムアウトスプール内の帳票出力情報から取出し、同取出したキー値に従い、上記帳票形式定義及び索引キーファイルを参照して、配信先アドレス及び配信タイプを認識する手段と、上記配信先アドレス及び配信タイプと上記システムアウトスプール内の帳票出力情報取出しアドレスとが対応付けて登録される配信管理テーブルと、同配信管理テーブルの内容に従い上記システムアウトスプールから帳票出力情報を取出し配信する配信手段とを備えたことにより、人手を要せず、帳票単位で配信タイプに従った自動配信を行なうことができる。

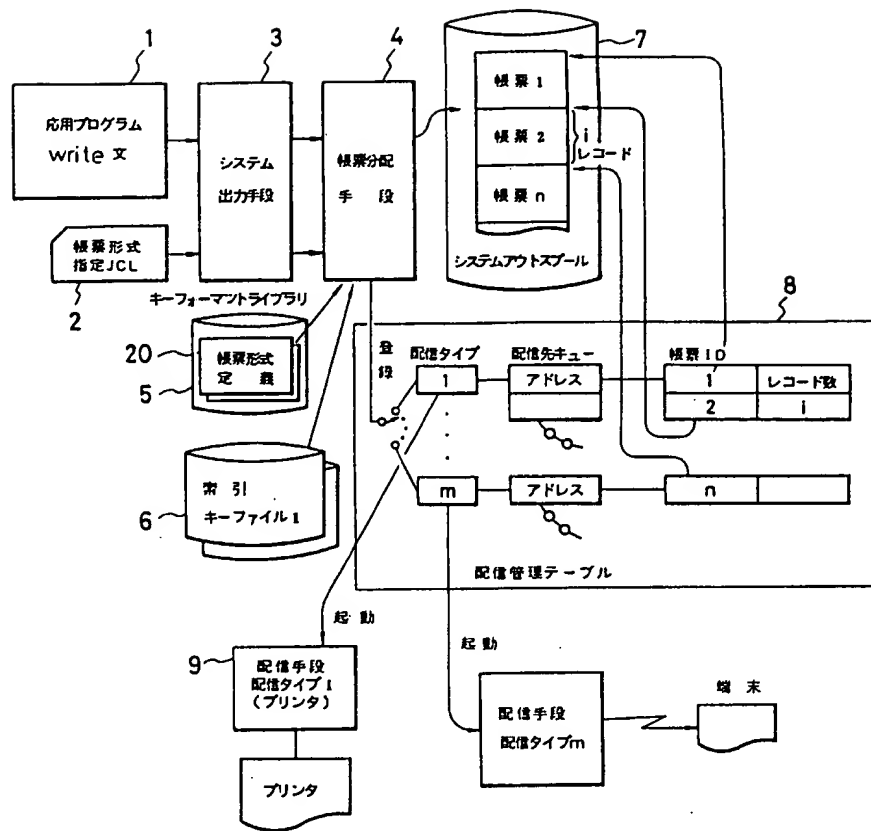
4. 図面の簡単な説明

第1図は本発明の一実施例によるシステム構成を示すブロック図、第2図は上記実施例に於ける、帳票上の領域を定義するキーフォーマット及びキ

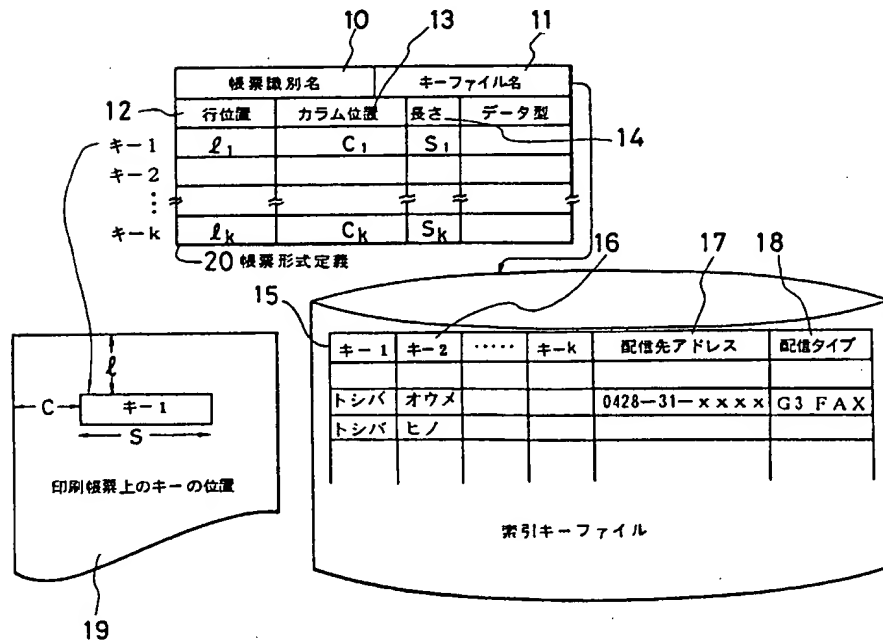
ー値と、配信先のアドレス及び配信タイプを対応付けるキーファイル形式とを示す図、第3図は従来の帳票類配信手段を説明するためのブロック図である。

1…応用プログラム、2…帳票形式指定手段（帳票形式指定ジョブ制御言語（JCL）又はコマンド）、3…システム出力手段（システムアウト手段）、4…帳票分配手段、5…キーフォーマットライブラリ、6…索引キーファイル、7…システムアウトスプール、8…配信管理テーブル、9…配信手段、10…帳票識別名、11…キーファイル名、12…行位置、13…カラム位置、14…長さ（桁数）、15…索引キーレコード、16…索引キー、17…配信先アドレス、18…配信タイプ、19…印刷帳票形式、20…帳票形式定義。

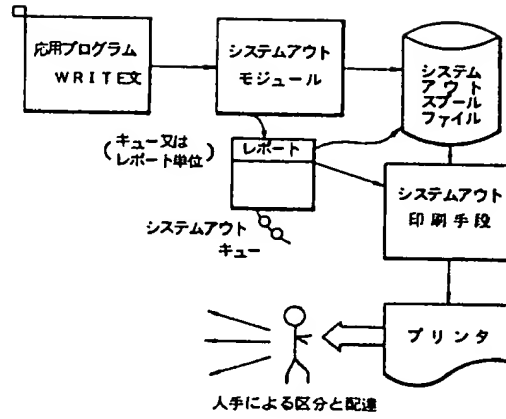
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第 1 図



第 2 図



第 3 図

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S1 (((human OR people OR employee OR employer)) AND
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 S3 S1 and S2
 S4 S3
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- ☐ 1 Losing good employees represents a net loss of training costs, cost of recruiting, and negative influences on morale. - February, 1980 - Gale Group PROMT®
- ☐ 2 Selecting a site for corporate training sessions requires matching the client's needs to the site, a process that grows more difficult in view of the many new sites being built. - December, 1981 - Gale Group PROMT®
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- ☐ 5 Guidelines for developing a hazardous waste management plan. - Aug 4 - 1983 - Gale Group Trade and Industry Database™
- ☐ 6 The Kaypro 10; more than just a big screen portable. (evaluation) - Dec - 1983 - Gale Group Trade and Industry Database™
- ☐ 7 Toss your keyboards and just tell your computer what to do. (voice technology) - Jan - 1984 - Gale Group Trade and Industry Database™
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- ☐ 10 GE tells why it sold its housewares. - May 14 - 1984 - Gale Group Trade and Industry Database™
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Database Name Database Number

ABI/INFORM	15
PROMT (90- PRESENT)	16
TRADE&INDUSTRY	148
PROMT (1972-1989)	160
COMPUTER DATABASE	275

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S1	((human OR people OR employee OR employer)) AND ((match?(3N)criteria) AND (amount OR degree OR severity) (4N)(match?)))
S2	PY=((1970:2000))
S3	S1 and S2
S4	S3
S5	RD
S6	SORT /ALL/pd,a

- ☐ 1 Find that file. (Special Report - Getting Organized) (hard disk files) - June - 1989 - Gale Group Computer Database™
- ☐ 2 Reconciling accounts the automated way. - Jan - 1990 - Gale Group Trade and Industry Database™
- ☐ 3 Evaluation of efficacy of liver transplantation in alcoholic cirrhosis by a case-control study and simulated controls. - August 20 - 1994 - Gale Group Trade and Industry Database™
- ☐ 4 To merge and not to merge: Israel's union list of monographs in the context of merging algorithms - Sep 1994 - Word Count: 5495 - ABI/INFORM®
- ☐ 5 Matching MCBS and Medicare data: The best of both worlds - Spring 1997 - Word Count: 8276 - ABI/INFORM®
- ☐ 6 DNA database searchers and the legal consumption of scientific evidence - Feb 1999 - Word Count: 23921 - ABI/INFORM®
- ☐ 7 Turning your reconciliation function into a management-reporting process - Mar/Apr 1999 - Word Count: 2383 - ABI/INFORM®
- ☐ 8 Lawson Customers Win Information Week E-Business Recognition. - Dec 13 - 1999 - Word Count: 1153 - Gale Group PROMT®

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Eppig, Franklin J Chulis, George S

Health Care Financing Review, v18n3, Page: 211-229, Spring 1997 (includes Charts References)

Survey reports from the Medicare Current Beneficiary Survey (MCBS) were matched to Medicare administrative files to create the 1992 MCBS Cost and Use file. This file improves on previous MCBS Access-to-Care user files by representing the entire (ever enrolled) Medicare population and including services not covered by Medicare such as outpatient prescription drugs and long-term facility care. The matching and reconciliatory process improved the accuracy and completeness of healthcare use and cost. For example, Medicare billing data corrected 22% of survey reports that did not record Medicare as a payer and 39% in which the amount was missing.

Headnote:

Survey reports from the Medicare Current Beneficiary Survey (MCBS) were matched to Medicare administrative files to create the 1992 MCBS Cost and Use file. This file improves on previous MCBS Access-to-Care user files by representing the entire (ever enrolled) Medicare population and including services not covered by Medicare such as outpatient prescription drugs and long-term facility care. The matching and reconciliation process improved the accuracy and completeness of health care use and cost. For example, Medicare billing data corrected 22 percent of survey reports that did not record Medicare as a payer and 39 percent in which the amount was missing.

BACKGROUND

The MCBS is an ongoing household panel survey of approximately 12,000 elderly and disabled persons eligible for Medicare benefits.¹ Field work for the MCBS began in September 1991. To date, five MCBS Access-to-Care Public Use Files (PUFs)-1991 through 1994-have been produced and made available to the public. The Access-to-Care PUFs link survey data on access to and satisfaction with health care, supplementary health insurance, and health and disability status, which are typically collected in the fall round each year, to Medicare billing data that cover the entire calendar year.

These PUFs have been used extensively to analyze a variety of issues, including: access to health care (Physician Payment Review Commission, 1996; Rosenbach, Adamache, and Khandker, 1995); satisfaction with health care (Adler, 1995); premium payments for supplementary health insurance (Chulis, Eppig, and Poisal, 1995); the relationship between supplementary health insurance and Medicare spending (Chulis et al., 1993); risk adjusting per capita payments to Medicare health maintenance organizations (HMOs) (Gruenberg, Kaganova, and Hornbrook, 1996); examining favorable HMO selection (Rodgers and Smith, 1996); and the characteristics of users of home health services (Mauser and Miller, 1994).

There are, however, some significant analytic limitations to the MCBS Access-to-Care PUFs. One limitation relates to the population covered. The Access-to-Care files represent the "always enrolled," that is, elderly and disabled Medicare beneficiaries entitled to Medicare for the entire calendar year. This enrollment concept excludes persons who come on the Medicare rolls during the year. More significantly, it excludes most persons who died during the year. Persons in this group have medical expenses that are considerably higher on average than surviving beneficiaries (Lubitz and Riley, 1993).

Another limitation of the Access-to-Care PUFs is that they do not contain survey-reported use of health services and costs. The files do include use and payments for Medicare covered services from Medicare billing records. However, Medicare covers less than one-half of total health care expenditures for the elderly (Waldo et al., 1989). Two of the more financially significant health care services not covered by Medicare, and therefore not included in the Access-to-Care files, are

outpatient prescription drugs and long-term facility care.

The 1992 MCBS Cost and Use PUF is designed to create a more complete user file, one that uses an "ever enrolled" population concept and that includes all survey-reported use and costs. The "ever enrolled" population includes use and costs for all Medicare beneficiaries in the program for any part of 1992, including those who joined the program during the year and those who died during the year. The Cost and Use file also includes survey reports for services not included in Medicare central billing files, including prescription drugs, long-term facility care, and Medicare services provided by HMOs. In addition, for Medicare covered services, the completeness and accuracy of services used, payments made, and sources of payment has been improved by an extensive operation to match and reconcile survey reports and Medicare bills. This article describes the methods used and the results from the matching and reconciliation process used to create the 1992 MCBS Cost and Use file.

MATCHING SURVEY AND ADMINISTRATIVE REPORTS

There has been a continuing emphasis in government-sponsored research to find better ways to use government administrative records to verify and augment information reported on surveys (Okner, 1974; Jabine and Scheuren, 1984). The advantages of linking survey reports to administrative records include verifying the accuracy of survey reports, adding data that was not (or could not be) obtained in the survey, and reducing the reporting burden on respondents. In health surveys, in particular, it has long been recognized that respondents may not be the best source of information on payments for health care services, particularly if health insurance companies are making payments directly to providers on the respondent's behalf (Cohen and Carlson, 1994).

In the case of Medicare inpatient hospital services, for example, a lump-sum payment is made directly to a hospital based on the patient's diagnosis-related group (DRG). A beneficiary reporting an inpatient hospital stay rarely if ever would know the amount the Medicare program paid the hospital. For other types of Medicare services, such as physician visits, the beneficiary is notified of Medicare program payments in an Explanation of Medicare Benefits (EOMB) form. In the survey interview setting, however, the typical respondent is usually able to recall the amount that they paid out-of-pocket for a health service, but is less clear on the amount that Medicare, a private supplementary insurer, or other third party paid on their behalf.²

Table 1 shows item non-response rates for selected variables in the MCBS in 1992. It makes clear that demographic and socioeconomic questions are much better reported than charge and payment amounts. Since accurate and complete information on use of services, payments, and sources of payment are the primary objectives of the MCBS, item non-response rates of 25 percent and higher for charge and payment questions are not acceptable. Anticipating this difficulty, it was understood from the planning stages of the MCBS that survey-reported dollar amounts would have to be verified and augmented using Medicare billing data.

Other national health surveys, such as the 1987 National Medical Expenditure Survey (NMES), also relied on matching survey reports to provider records (Cohen and Carlson, 1994). However, due to the expense involved in matching and reconciliation, the NMES provider follow-back to verify survey reports was limited to a 25 percent sample. (The sample was judiciously constructed to over-represent events and persons which would give good returns to provider follow-back. The strategy included disproportionately high shares of expensive hospital claims and Medicaid enrollees, who are particularly poor survey respondents.) A limitation of the NMES provider follow-back survey was that it relied on the survey reports to identify the providers to be contacted. While this approach would undoubtedly improve accuracy for survey-reported health events, it was more limited in correcting for events that were omitted. That is, if a respondent did not report a health event, and that provider was not reported for another event by that person during the interview, the missed event would never have a chance to be detected in the provider follow-back survey.

Under-reporting of health events is a serious problem in health surveys. In general, the farther removed in time a health event is from the interview date and the less salient or significant the health event is in the person's life, the higher the likelihood it will not be reported in the interview.³ As a rule, respondents remember and report inpatient hospitalizations better than doctor visits, and doctor visits in the last 2 weeks better than those occurring 2 months ago. The recall period for MCBS interviews is usually about 4 months. Unfortunately, this problem cannot simply be solved by more frequent interviews and shorter recall periods. In addition to the considerable extra expense that would be involved in interviewing more frequently, there is evidence from an earlier national health panel survey that expected gains in recall by more frequent interviewing and shorter reference periods could be offset by negative "conditioning effects" due to increased reporting burdens on respondents (Cohen and Burt, 1985).

(Table Omitted)

Captioned as: Table 1

For these reasons, conducting a match that will detect both survey under-reporting and reporting inaccuracy is clearly preferable. Fortunately, virtually complete billing records of services used and payments made under Medicare fee-for-service transactions are kept in HCFA files.⁴ The MCBS-a HCFA-sponsored survey-was uniquely positioned to do a match of survey reports to billing records. Unlike other health surveys, the MCBS was designed from the start to be a full partner with Medicare administrative records. Survey reports have been joined to bill records to form a more complete and accurate file than would be possible using either source alone.

CRITERIA FOR THE MATCH

In terms of survey methods, this is an "exact" match of information for the same person from two different data sources, not a synthetic or "statistical" match which imputes information to an individual based on similarities in key characteristics (Okner, 1974). The unique health insurance claim number (HICN) for each Medicare enrollee is recorded on each of the central office administrative billing records. A sample person's HICN is known when he or she is selected for the MCBS. Sample persons are asked in the first interview to verify their HICN by showing their Medicare identification card, and their HICN number is then permanently associated with all subsequent survey records. This unique personal identifier that is common to both record sources insures that all survey and administrative billing records for each person can be pulled together prior to the match.⁵

Although administrative records hold out the potential for improving survey reports, previous experience has shown that the matching process is never straightforward, and that it is not wise to simply assume that the administrative data is the "correct" source. Previous efforts to match survey reports to administrative records have shown that both data sources in a match, not just survey reports, invariably have limitations which complicate the matching process and the interpretation of results. As Winn and Walden commented in a review of several methods studies that examined matches of survey reports to administrative records, "survey researchers should not use administrative record data as a 'gold standard' or even 'gold plated standard'" (Winn and Walden, 1989).⁶ The limitations of administrative records when matched to survey reports are generally not due to poor quality record keeping, but rather stem from differences in the basic purposes for which the records were created. In discussing an analysis of a match of survey reports to Medicare bills, Verbrugge made the same point this way: "Billing systems have motivations quite unrelated to patient care...There is no one to one relationship between visits and bills. To compare them, that relationship has to be constructed..." (Verbrugge, 1989).

Our approach in constructing the match between MCBS survey reports and Medicare central office billing recordsdissimilar records collected for different purposes-was that neither source should be considered a "gold standard."⁷ Each source has its strengths and limitations. For each item of information collected from both sources, decisions were made based on the likelihood that one source would be more accurate or complete than the other source in the context of that particular comparison. The objective was a combined record that embodies the best features of each data source, and that was more accurate and complete than either the survey reports or billing records used alone. In general, Medicare bill records were thought to be the more accurate source for information:

That a health service occurred. (A billing record showing Medicare payment for a service that was not reported on the survey was considered a memory lapse by the respondent.) That Medicare was a payer. (A billing record showing Medicare payment for a service was considered to be more accurate than the respondent not reporting Medicare as a payer.)

On the amount paid by Medicare. (The Medicare payment amount in the records was considered more accurate than the amount reported by the beneficiary. As noted above, there are good reasons why a beneficiary would not know the DRG payment for inpatient hospital services or the amount paid the physician under the relative value based physician fee schedules.)

In most other situations, and particularly regarding reports of amounts paid out of pocket, the survey reports were given precedence. Figure 1 illustrates three important issues that had to be considered in designing the match of MCBS surveyreported events to Medicare central office billing records.

NARROWING DOWN SURVEY REPORTS

Survey-reported events (labeled "1" in Figure 1) are broader in scope than Medicare billing events because the survey collects information on all health services, including services not covered by Medicare. This means that survey events that are clearly not Medicare covered services, such as prescription drugs, must be eliminated prior to the match. However, this process must be done carefully to avoid removing any survey events that could conceivably match a Medicare billing record had they been left in the match. On the other hand, including types of survey events for which a match is possible but not probable could increase the chance of "false positives," matches that qualify according to matching criteria, but are not really genuine. After considering these tradeoffs in light of the variables to be used in establishing a match, we decided to use a fairly unrestricted approach. For example, we included all survey reports of dental services in the match even though Medicare rarely pays for dental procedures.⁸ In part, this reflected our desire to match as many survey reports as possible. But we also judged that, given the specific variables used to identify a match, the risk of false positive matches was not large. (One clear implication of this decision to broaden the types of survey reports included in the match is that a large share of survey reports can reasonably be expected not to match a Medicare bill.)

COMPARABILITY OF SURVEY RECORDS AND BILLS

A significant number of events-the expected matches-will appear in both the survey events and Medicare billing records (labeled "2" in Figure 1). However, Medicare billing records often do not record events in the same way that they were reported in the survey. A respondent may report a visit to a physician as a single event on the survey. However, Medicare's fee-for-service billing records may have recorded separate payments for a physician service, an X-ray, a laboratory test, supplies such as bandages, etc. for that same visit. This means that extensive effort is required to put survey-reported "events" and Medicare billing "events" on the same basis prior to matching. It also raises the philosophical question of which concept of an event is more appropriate, and just how far it is desirable to go in shaping survey reports to look like Medicare events or vice versa. We discuss these issues in more detail later.

(Graph Omitted)

Captioned as: Figure 1

UNMATCHED MEDICARE CLAIMS AND SURVEY REPORTS

A final point is brought out by Figure 1. If ordinary presuppositions about survey under-reporting because of memory decay over a 4-month reference period are correct, we would expect there to be unmatched Medicare billing records. These medical events (labeled "3" in Figure 1) represent services paid for by Medicare that were not reported on the survey

In many matches, the size of the share of matched records is considered a measure of the success of the match.⁹ This generalization is appropriate for matches where there is every reason to expect that all records on both sides should find a match. That is not the case for this particular match, however. On average, Medicare only pays for about one-half of a beneficiary's personal medical expenditures (Waldo et al., 1989). Survey reports cover all medical services, not just Medicare covered services. As noted, liberal rules were deliberately used to define what survey reports would be included in the match. In these circumstances, a large number of unmatched survey reports would not be unexpected or surprising. These unmatched survey reports are predominantly non-Medicare services that should not have matched a Medicare claim.

There are also good reasons for unmatched Medicare claims on the other side. Unmatched Medicare claims, in our matching scheme, can be viewed as a measure of, and a correction for, survey under-reporting. Rather than being viewed as an unsuccessful match, these unmatched Medicare claims are a source of value added to the post-match final file.

WHAT CONSTITUTES AN "EVENT"?

While it is relatively easy to match survey reports and administrative bills at the person level because of the common health insurance claim number in both sources, it is considerably more difficult to match survey reports and billing records at the event level. Often services which are reported as a single event by a sample person are disaggregated into multiple events in the billing records. For example, an outpatient visit may result in multiple Medicare claims. Conversely, multiple visits with the same provider may be reported as separate events by the sample person and be reported on one billing record in the administrative records. What is the best way to construct a one-to-one relationship between survey-reported events and billing data? Should the match be done at the most disaggregate event level possible?

Or would a better approach be to match "bundles" of separate services that are conventionally reported together? Using either approach, some basic issues must be addressed.

First, there is wide variation in the resources embodied in the conventional categories used to classify health events, such as inpatient hospital stays, physician visits, outpatient hospital visits, durable medical equipment, home health visits, etc. These commonly accepted categories of medical "events" differ widely with respect to time covered, resources employed, level of medical skill employed, or therapeutic significance. An inpatient hospital stay, which covers multiple days, involves care from multiple persons, consists of many medical services and supplies, and is very expensive, is considered one event. A simple follow-up visit to a physician is also considered one event. When "events" differ so fundamentally in resource inputs employed and costs covered, meaningful comparisons of events across types of service are very difficult. With regard to matching operations, an unmatched inpatient hospital event is a much more serious matter than an unmatched followup visit to a physician.

In addition, as noted in the example of an outpatient visit, a single event reported in the survey may be recorded as multiple events in Medicare billing records (e.g. facility bill, physician services, X-ray, supplies, etc.). Matching these events as they are found in both files means being able to match a single event on one side to a "bundle" of events on the other. These differences in what constitutes an event across service types, and what constitutes an event across the two record sources, make it difficult to find an event definition that is clearly superior, or more appropriate, for the purposes of this match. After considering the alternatives carefully, the decision was made not to always disaggregate to the most fundamental level, but instead to match bundled events in the ways that they naturally occurred in both files. The practical effect of this approach is to concentrate more on getting the charge and payment dollars matched correctly, and less on reconciling differences in how events are recorded in the two sources.

DIFFERENCES IN EVENT CATEGORIES

Another basic difficulty in designing an event-level match between survey-reported events and Medicare billing records is that they are categorized very differently. The MCBS type-of-service categories correspond to the way that an ordinary respondent would classify and group various health services. Medicare billing records, on the other hand, are grouped by the type of provider that furnished the service (Table 2).

There are more than twice as many MCBS categories (9) as Medicare bill categories (4).¹⁰ In some cases this is because Medicare does not cover all medical services, while the survey does. A good example is dental services, which are rarely covered under Medicare. Another category on the survey side that is not shown on the bill side is emergency room services. In the Medicare claims system, emergency room services that are immediately followed by an inpatient stay are included in the inpatient DRG payment. There are no additional separate bills or payments. Emergency room services that do not result in inpatient hospitalization are classified as outpatient hospital services.

EVENT-LEVEL MATCHING

Event-level matching is actually a series of matches. An event from a Medicare claim category must often be matched against more than one MCBS event category, and vice versa. Different algorithms are used in conducting the matches depending on the data elements available. The sequence of matches across categories always proceeds from categories that are most likely to match to categories that are less likely. Table 3 shows an overview of the match sequencing.

(Table Omitted)

Captioned as: Table 2

Matching attempts are done iteratively beginning with strict match criteria and proceeding to less restrictive. For example, reported doctor visits are initially compared with carrier control number, date of service, and total charge. If there is no successful match, the algorithm checks for a match on physician name and date of service or on total charge and date of service. If there is still no successful match, the program looks for a match on physician name and total charge with the date of service relaxed to within a week. The match routines thereby link survey events to Medicare billing records while simultaneously indicating the strength of the link.

As previously noted, the match is designed to allow survey-reported events to be matched to multiple Medicare claims and vice versa. Multiple links are often valid, and the matching process is hierarchial and iterative. For example, a survey-

reported doctor visit may be linked to a Medicare bill record for the physician's service and a Medicare bill record for laboratory services for blood drawn during the visit. In some cases, a stronger match occurs later in sequence of matches than an initial weak match. For example, a survey-reported doctor visit may have a weak link to a Medicare physician/supplier record and a strong link to a Medicare outpatient hospital record. MCBS staff used the match strength indicator, and an examination of the potential for bundling and unbundling on both sides, to resolve situations with multiple matches.

This match strategy differs from other approaches, such as that used by the NMES to match medical follow-back provider records to a sample of survey reports (Cohen and Carlson, 1994). In that matching system, statistical probability values are assigned to indicate the strength of a match of survey reports to follow-back provider records. There is an important difference in the objectives of the NMES and MCBS matches, which resulted in different matching strategies. The desired objective of the NMES provider follow-back match is a fully mapped, one-way match of survey reports to the provider follow-back administrative records sample. While a 100-percent match is very difficult to achieve in practice, at least in theory-or as an ideal objective there is no reason why each survey-reported event should not find a matching provider record. (There may also be other services from that provider that should have been reported on the survey but were not, but these non-reports do not contravene the point that, at least in theory, 100 percent of survey-reported events should match a provider record.) In these circumstances, non-matched survey reports are regarded negatively as matches that should have occurred, as failures of the matching criteria and processes. In this type of one-way match, a statistical probability value representing potential match strength is a very useful way of characterizing the strength of the link between the survey report and the provider record.

(Table Omitted)

Captioned as: Table 3

However, the MCBS match is structured differently. As illustrated in Figure 1, there is never any presumption that all survey reports will match a Medicare billing record. The survey collects information on all personal health services, not just Medicare services. This means that unmatched survey reports are to be expected-a health service not covered by Medicare should never match a Medicare billing record. On the other side, it is reasonable to expect, because of memory lapses or lack of full survey participation, that some Medicare billing records will never find a matching survey report. The final file will be composed of three separate elements:

A file of matched survey-reported events and Medicare billing records in which the best information from each source is combined to make the most complete and accurate record possible.

A file of unmatched survey-reported events. These are presumed to be non-Medicare covered services.

A file of unmatched Medicare billing records. These are presumed to be services that should have been reported on the survey, but were not for some reason.

The primary emphasis of the matching processes, in this type of three-way situation, is to be certain that all records are in their correct category. In this matching scheme, any Medicare covered services that should have matched, but did not, will result in duplicate counting when the three segments are combined. There will be an unmatched survey report and an unmatched Medicare billing record that should have been recorded as a single matched event, but instead will be counted as a Medicare non-covered service on the survey side and a survey under-report on the Medicare billing side. In this situation, a single strength of match indicator is less useful than repetitive efforts from different directions to make sure that each record ends up in its proper category. The hierarchical, sequential, and iterative process used for the MCBS match was specifically designed to find all possible matches, and thereby to reduce the risk of double counting in the final file.

For a very large subset of Part B events (around 40 percent) there was a unique carrier claim number available in both the Medicare billing records and the survey-reported event.¹¹ This is the unique claim control number the carrier assigned to the Medicare payment record, and which also appears on the EOMB form sent to the beneficiary. This number, when available, was collected in the survey interview from the EOMB. Because it appeared in both the Medicare billing record and the survey interview reports, this field guaranteed a correct match for the subset of claims and survey reports on which it appeared.

Cohen (1996) discusses the value of a "truth set," a set of records that are known matches. The records with matched carrier control numbers served that purpose in this match. In addition to the match certainty they provide for a large subset of cases, they also can be used to set and adjust matching criteria for cases where carrier control numbers do not appear. By fine tuning the match criteria using the known matches, these criteria can be set to be sure they do not overmatch (create false positives) or undermatch (create false negatives). One of the more useful insights that came out of the analysis of the known matches was that survey respondents often confused the location of visits, particularly for outpatient hospital and doctor's office visits. Knowing this, the location variable was not relied on as heavily as other variables (such as date of service and doctor's name) in deciding whether there was a potential match. In addition, community physician visits and outpatient hospital visits on both sides were then routinely cross-matched to increase the probability of picking up any misreported potential matches.

After the initial match criteria were established, a person-by-person analysis was conducted. For all persons who had both survey events and Medicare billing records, a determination was made concerning which match criteria resulted in false positives and which match criteria should be relaxed to avoid false negatives. In situations where there are unmatched events on both sides in the same type of service category, more detailed information from the billing records-such as Current Procedural Terminology (CPT) procedure codes-was used to make a judgment whether these items should be a match.¹² This additional service-specific detailed information was often helpful in identifying matches missed in the earlier stages of the matching process.

RESULTS OF THE MATCH

A total of 192,666 Medicare bill events for original sample persons during the time they lived in the community were matched against 179,966 survey reports (Table 4). A match was recorded for 104,349 event records, which is 54 percent of total Medicare bill records and 58 percent of survey-reported events. The percentage of total dollar payments matched was considerably higher. The 88,000 unmatched Medicare bill records represent 46 percent of Medicare events, but only 24 percent of total Medicare payments. The 76,000 unmatched survey events represent 42 percent of all survey events, and 24 percent of survey-reported payments. Looking from either direction, the match was able to account for over three-quarters (76 percent) of reported Medicare payments.¹³

The average payments for unmatched events was considerably lower than for matched records. Unmatched Medicare events (\$113) were about 60 percent below the average payment for matched events (\$285). This is consistent with past household survey experience that more salient and more expensive medical events are more likely to be remembered and reported at the interview. Unmatched survey reports (\$131) were less than one-half the average payment for matched events (\$285). This is consistent with the fact that Medicare covers the more expensive treatments (such as inpatient hospitalization and outpatient hospital treatment) entered into the match.

The very low average Medicare payments for unmatched survey events (\$23) require some explanation. If the match had worked exactly as hoped, every survey event reporting Medicare dollars should have found a matching Medicare bill record. The unmatched survey events category would consist entirely of non-Medicare services, which by definition should not have any Medicare dollars reported for them (meaning the average Medicare payment in Table 4 should be zero). In fact, about 16,000 of the 75,000 unmatched survey events had a positive Medicare payment amount. The seemingly very low average amount (\$23) results from nearly 16,000 records with reported Medicare payments of \$114 being averaged together with nearly 60,000 unmatched survey amounts with zero Medicare dollars. We later discuss how the 16,000 unmatched survey events with Medicare dollars were handled in creating the final file.

EVIDENCE SUPPORTING IMPROVED ACCURACY

One of the primary objectives of the match was to test, and where possible, improve the accuracy of survey reporting. Medicare should have been reported as a payer on 100 percent of the 104,000 survey-reported events that matched a Medicare bill. However, as shown in Table 5, Medicare was only reported as a payer for 81,000, or 78 percent, of survey-reported events. This means that MCBS survey respondents were not aware that Medicare was a payer on one of every five events where Medicare records show that program payments were made. By matching survey reports to Medicare bills, 22 percent of the matched survey-reported events were corrected to make Medicare a payer of record.

(Table Omitted)

Captioned as: Table 4

Table 5 also shows that, for the 104,000 events where survey reports matched Medicare bills, the Medicare payment amount was only reported on 61 percent of survey reports. This means that for two of every five events paid by Medicare and matched to a survey event, survey respondents are not able to report the amount that Medicare paid. The match made it possible to fill in the correct Medicare payment for the 39 percent of matched survey reports where no Medicare payment amount was reported.

Another dimension of survey-reporting accuracy that could be checked in the match was how accurately the survey respondent reported the total and Medicare payment amounts, when they reported both these items. As shown in Table 6, both a Medicare payment and total payment were reported on 63,000 of the 104,000 matched records (61 percent). However, there were wide differences between survey-reported amounts and Medicare billing record amounts. Survey respondents consistently overestimated Medicare payments for health services. On average, survey reports were 28 percent higher (\$131) than Medicare payments recorded in administrative billing records (\$102).

Part of the higher survey-reported Medicare dollar amounts could be due to the previously noted differences in the way that services are "bundled" on the survey and in Medicare billing records. We noted earlier that a single survey-reported visit could appear in Medicare payment records as multiple records; for example, a physician's visit, a lab services fee, and a fee for other medical services and supplies. If all three pieces on the Medicare billing side were not matched to the survey report, this would explain part of the higher survey-reported amount in our subset of matched cases. However, the primary reason that survey respondents overstate the amounts that Medicare pays may be more fundamental. Medicare beneficiaries are probably better informed about the provider's charges than the generally lower cost-based DRG payments for inpatient services and fee-schedule based payments for physician services. They may assume that Medicare pays a higher proportion of the provider than actually occurs.

(Table Omitted)

Captioned as: Table 5

(Table Omitted)

Captioned as: Table 6

Survey respondents overestimated total payments even more than they overestimated Medicare payments (Table 6). The average survey response estimate for total payments (\$239) was 66 percent higher than the total payments derived from the Medicare approved payment amount on Medicare billing records (\$144). Total Medicare approved payment amounts include several primary components: Medicare payments, private insurance payments, out-of-pocket payments, and Medicaid payments. A large part of the higher reported total payments from survey respondents may be due to a definitional difference. Total Medicare approved payments are the amounts that are payable under current Medicare law and regulations. These amounts may be from a fee schedule, or limited by law in some way, and are generally lower than provider charges. Therefore, Medicare approved amounts could reasonably be expected to be lower than total payments reported on the survey.

Beneficiaries apparently are not aware of the limits and adjustments that Medicare makes to provider charges in reaching the Medicare approved payment amount. They also may not be aware that supplementary private insurance payments and Medicaid payments are keyed to the Medicare approved payment amount, not the provider's charges. Table 6 shows that beneficiaries consistently overestimate total payments made to medical providers, outpatient hospital services, providers of other medical services, and separately billing physicians and laboratories. Beneficiaries are generally reliable when reporting what they pay out of pocket, but in reporting the remainder of total payments they seem to be assuming that the balance of provider charges (not the generally lower Medicare approved amount) are somehow paid in full by Medicare and the other payers.

In the aggregate, survey-reported Medicare payments overstated the Medicare payment shown in the Medicare bill records by \$5.7 billion; the survey-reported total payment overstated the total payment amount from the Medicare bill records by \$16.4 billion (data not shown). One of the effects of these consistent overestimations is to distort Medicare's share of total payments. Survey reports indicate that Medicare paid 55 percent of total payments for the 63,000 services where both Medicare payment and total payment were reported. Medicare billing records, on the other hand, show Medicare's share of total payments to be considerably higher: 71 percent. Whatever the cause of respondents' propensity to overstate both Medicare and total payments, the match made it possible to correct the systematic payment

overestimates that would have resulted if only survey reports had been available.

Evidence of Survey Under-Reporting

In a conventional (100-percent mapped) match in which all survey reports were expected to match Medicare bills, the 88,000 unmatched claims and 76,000 unmatched survey reports would suggest that a large number of potential matches were not identified. However, as noted earlier, the MCBS match structure expects unmatched Medicare bills (which represent events that occurred but were not reported in the survey) and unmatched survey reports (which represent health care services not covered by Medicare and therefore should not match a Medicare claim). Table 7 shows record and dollar counts for all matched and unmatched records by type of service. In general, matched records had higher average Medicare payments (\$226) than unmatched Medicare claims (\$93) and unmatched survey reports (\$23).

One way to assess how many of the 88,000 unmatched Medicare paid bills are under-reports-as opposed to unidentified matches-is to examine the characteristics of the unmatched survey events. A stepdown analysis of various categories of unmatched was performed to determine the possible extent of unidentified matches in the 76,000 unmatched survey reports. In general, except for one group of claims, we concluded that a large majority of these events could not be reasonably expected to be undiscovered matches.

Unlikely Matches

Over 10,000 unmatched survey events were for dental services, which are rarely covered by Medicare.

Almost 8,000 unmatched survey events had total payments equal to zero. These were very likely parts of bundles of services that were covered in one global payment on the Medicare claim side, for example, postoperative services which were covered by a global surgery fee. Since finding a match would add no dollars to the matched records group, little energy was expended in trying to rebundle these non-payment records in a match.

Another 5,000 unmatched survey events were for Medicare HMO enrollees. Virtually all of the Medicare services for these persons are paid through a capitated payment amount and no billing records are submitted to HCFA central files. Consequently, the likelihood is very small that their medical events could ever match a Medicare bill record. There were 3,500 unmatched survey events where the sample person was only entitled to Part A or Part B of Medicare, but not both. Therefore a survey-reported service could not reasonably be expected to match a Medicare paid bill record for services for which they were not eligible. Another 2,200 unmatched events were provided by the Veterans Administration or in a military installation where no Medicare bill would be expected. Over 14,000 unmatched survey events were for other medical services. While Medicare covers durable medical equipment such as wheelchairs and supplies such as oxygen, it does not cover many items in the broad other medical services category such as eyeglasses, hearing aids, heating pads, incontinence supplies, etc. Average Medicare payments for unmatched survey reports of other medical events (\$10) were just a small fraction of average payments for matched events (\$132) and unmatched Medicare claims (\$128) in the same category. This suggests that very few of these records have reported Medicare payments, and most unmatched survey events in this category are probably services not covered by Medicare.

(Table Omitted)

Captioned as: Table 7

In summary, the above items taken together mean that over 40,000 of the 76,000 unmatched survey events either definitely could not, or very likely would not, match a Medicare bill event record. This leaves 36,000 unmatched survey events to be explained.

Likely Undiscovered Matches

There is also a group of unmatched survey events that are very likely to be unidentified matches. Almost 16,000 unmatched survey-reported events reported a dollar amount paid by Medicare. These events are questionable because Medicare billing records represent virtually all payments from Medicare trust funds. Although it is remotely possible that these survey reports are Medicare covered services that somehow are not represented in Medicare billing records, the much more likely possibility is that these are unmatched survey events that should have found a match in Medicare bill

records. That is, they are really duplicates for an unmatched Medicare bill record. If they were left in the final file summaries, the total and Medicare dollars reported on these records would duplicate total and Medicare dollars already included in the unmatched Medicare claims. To avoid duplication in the final file, these records were not included in the file summaries created to represent total and Medicare use and cost figures.

As previously noted, if the match completely succeeded in correctly classifying each unmatched survey report as a non-Medicare service, there would be no Medicare payments shown for unmatched survey events in Table 4. By removing these 16,000 unmatched survey events from the final file, we remove all reported Medicare payment dollars from a match class that, by definition, should not include any Medicare covered services.

Ambiguous Events

This leaves about 20,000 unmatched survey events to be explained. There are many medical services and supplies that Medicare does not cover. For example, physical examinations if the person is well, most alternative medicine services, over-the-counter supplies, etc. We assume that most of these events are non-Medicare services that could not have matched, and thus should be added to the final file.¹⁴

Estimate of Survey Under-Reporting

As discussed, 40,000 of the unmatched survey events were unlikely candidates to match a Medicare billing record; 16,000 events with Medicare payment amounts reported were in fact duplicates that should have matched; and a residual 20,000 records were considered more likely to be non-Medicare services than unfound matches, and they were added to the final file. Using these figures, it is possible to compute a range for survey under-reporting of Medicare services uncovered by the match.

Subtracting the 16,000 survey report records that should have matched from the 88,000 unmatched Medicare bills, leaves 72,000 records paid for by Medicare, but without a match from the survey. This suggests that 38 percent (72,000 over 192,000) of medical events paid by Medicare were not reported on the MCBS. The estimated share of dollars underreported on the survey is smaller because, as previously noted, unmatched Medicare bills had lower payments on average than for matched bills. Using the average total payments for unmatched survey reports and Medicare claims to do the calculations, about 20 percent of total payments were under-reported on the MCBS.

A more conservative estimate would add the 20,000 residual records to the 16,000 to make 36,000 unmatched survey-reported events that could conceivably be unfound matches. Subtracting 36,000 from 88,000 leaves 52,000 Medicare bills that do not have a match in survey events. This implies that 27 percent (52,000 over 192,000) of medical events paid for by Medicare were not reported on the MCBS. In dollar terms, about 15 percent of total payments were under-reported. Whichever estimate is preferred, it is clear that survey under-reporting of medical events is a very serious problem for the Medicare population.

Comparing Match File Versus Survey Results Alone

A final way to evaluate the contributions of the match to the accuracy and completeness of the final file is to compare the post-match results to those that would have been obtained from the survey alone. Table 8 shows total events, Medicare events, total payments, and Medicare payments from the final matched file compared to the survey file alone.¹⁵ The match greatly increased the number of health service events reported on the survey. Total events were 39 percent higher and Medicare events were 80 percent higher after the match when compared to survey reports alone. Even given the discrepancy in how events are reported between sources, and the wide variation in what constitutes an "event," these represent significant corrections to survey reports.

Total survey-reported payments were lowered 10 percent by the match. Medicare payments, on the other hand, were increased 27 percent by the match. These adjustments were the net effect of survey respondents simultaneously underreporting Medicare events while overestimating both Medicare and total payments for the events they did report. These large changes in survey-reported health events and payments in the post-match final reconciled file illustrate the value of the match. The post-match file presents a considerably more accurate and complete picture of health services use and costs by Medicare beneficiaries than would have been obtained from survey data alone.

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(Table Omitted)

Captioned as: Table 8

Footnote:

1 See Adler (1994) for a full description of the MCBS.

Footnote:

2 To eliminate the need for the respondent to search his or her memory or be forced to guess third-party payment amounts, the MCBS interview relies heavily on information from Medicare and private insurance statements.

Footnote:

3 An excellent summary of the literature on recall periods and reporting accuracy can be found in Cohen and Burt (1985).
4 The primary group for whom there are missing or incomplete central office bill files, and therefore could not be included in the match, are persons enrolled in Medicare managed care plans. In 1992, this represented 6 percent of Medicare enrollees. An estimated 97 percent of Medicare claims are posted to HCFA central billing records within 1 year (Eppig and Edwards, 1996).

Footnote:

5 While the HICN was used to create the Cost and Use file, it does not appear in the user file because this would violate the sample person's right to privacy.

Footnote:

6 Among the studies reviewed by Winn and Walden was a match of hospitalizations reported on the 1987 NMES survey to HCFA's Medicare Automated Data Retrieval System (MADRS). (Calore and Lim, 1989).

7 A discussion of the match methods and some early results were published in Eppig and Edwards (1996).

Footnote:

8 Medicare does not cover routine dental care and only pays for dental procedures when they can be shown to be integrally related to other strictly medical procedures, e.g., tooth extraction as part of jaw surgery.

Footnote:

9 See, for example, Cohen's (1996) discussion of the preliminary results from this match which were presented in Eppig and Edwards (1996).

Footnote:

10 Medicare bill categories also include home health and hospice bills, but these services were matched at the person rather than the event level, and so are excluded from Table 2.

Footnote:

li Part B refers to the supplementary medical insurance part of Medicare, which covers most medical services other than inpatient hospital and skilled nursing facility care.

Footnote:

12 These are procedure codes from the HCFA Common Procedure Coding System used to identify medical procedures on most billing records for physician's services. 13 These are dollars as reported, before any imputations or corrections.

Footnote:

14 The match showed that substantial survey under-reporting exists for Medicare covered services. There is every reason to believe that Medicare non-covered services are similarly underreported. Any duplicate records (unfound matches) in the last 20,000 of unmatched survey events added to the final file are likely to be considerably fewer than the number that would be required to correct for survey under-reporting of non-Medicare services.

Footnote:

15 These are post-imputation, final file dollar estimates.

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MINNEAPOLIS--(BUSINESS WIRE)--Dec. 13, 1999--

Industry Leaders Aviall, MacNeal Health

Selected to Top 100 e-Business List

Considered

Lawson Software, the only provider of Self-Evident Applications(TM) (SEA) for e-business, today announced that two LAWSON INSIGHT(R) II customers are named as top e-business performers by Information Week in the magazine's first annual e-Business 100 program. Lawson customers Aviall, Inc. (NYSE:AVL), the world's largest independent distributor of new aviation parts and a leading provider of inventory information services, and MacNeal Health Network, an integrated healthcare delivery network (IDN) composed of a 427-bed teaching hospital and more than 30 healthcare centers serving the greater Chicago area, were selected from more than 400 nominated companies.

The Information Week e-Business 100 is the magazine's program for recognizing companies achieving overall excellence in e-business initiatives. All nominated companies were assessed and evaluated by analysts from Hurwitz Group, a consulting and research firm specializing in strategic e-business and information technology initiatives, and by Information Week researchers and editors. Hurwitz Group specifically reviewed nominated companies' e-business strategies for their ability to execute on vision and meet objectives, their level of business and technology integration and overall innovation in e-business. Evaluation was based in part on Hurwitz Group's e-business excellence methodology, called Enterprise Advantage(TM), which incorporates an assessment tool, benchmarking and best practices compiled by analysts involved in enterprise e-business initiatives.

"The ultimate goal of e-business is to seamlessly integrate a company's interaction with customers, employees and partners," said Fern Halper, director, e-Business Applications Practice, Hurwitz Group. "It's a huge transformation, involving almost every area of the organization. This list is a chance to recognize those companies that have made significant progress in one or more of these areas."

Aviall Customer Focus, Internet Technology Leads Aviation

Industry e-Business

As the world's largest independent distributor of new aviation parts, Aviall is an industry leader in transforming itself into an e-business company. Aviall distributes and markets the products of more than 180 manufacturers and distributes approximately 90,000 line items from customer service centers in North America, Europe and Asia-Pacific.

"Lawson delivered the vast majority of the functionality we wanted out-of-the-box, which is rare among ERP solutions," said Jacque Collier, vice president, Aviall, Inc. "Lawson's technology platform and full Web deployability is well aligned for companies pursuing e-commerce and e-business initiatives. Our aviall.com Web site is completely integrated with Lawson solutions that automate order fulfillment initiated on the Web, saving us time and money and improving customer satisfaction."

Operating in a highly regulated industry, Aviall required an enterprise solution that allows detailed tracking back to manufacturers, as well as domestic and international serial tracing. The company realized that it could gain additional value from an enterprise resource planning (ERP) implementation by approaching its return on investment from a supplier and partner perspective. This strategy allows Aviall to further strengthen a key competitive differentiator - the company's focus on customer service and loyalty.

Aviall has been a Lawson customer since early 1997, soon after the company began its initiative to pursue a strategic e-business model. It is currently running live on LAWSON INSIGHT II Financials, Human Resources and Supply Chain Suites. Aviall's Lawson solutions operate on an IBM RS/6000 UNIX server.

MacNeal Health Targets Materials Management, HR for e-Business

Excellence

MacNeal Health Network, a 38-site primary care network, is leveraging Lawson's human resources and ijob Internet recruiting solutions as key components of its e-business strategy. The combination has streamlined hiring processes, reduced overhead and time spent on payment processing, and accurately tracks insurance information in real time. MacNeal is taking a two-prong approach to its e-business strategy, targeting materials management and human resources as areas for improvement via advanced technologies.

MacNeal leverages its materials management system to track what, where and how frequently supplies are used, then electronically re-order supplies for next-day delivery. This element of the organization's e-business strategy freed MacNeal's 7,000 square-foot warehouse for other uses.

MacNeal's other e-business initiative relies on Lawson's human resources and ijob solutions to greatly improve outcomes in recruitment and staffing. In an increasingly tight labor market, MacNeal recognized the value of recruiting and retaining the best available people.

"Just a few months after completing our installation, we are filling nearly all of our open positions with candidates identified through ijob," said David Printz, chief information officer, MacNeal Health Network. "We have reduced our hiring cycle from 37 to 20 days, and in just two months we filled more than half of our open information technology professional positions. ijob has been the main driver in our greatly improved recruitment outcomes."

Full integration of ijob with the LAWSON INSIGHT II Human Resources Suite allows MacNeal to capitalize on its Web recruitment strategy and take advantage of the solutions' competitive Web capabilities:

- Self Service HR Profiles - Candidates build and maintain their own human resources profiles.
- Interactive Position Matching - Candidates and recruiters can identify specific skills and qualifications for cross-reference with position requirements.
- Web-Based Pre-Screening - Interviews conducted via the Internet deliver qualified candidates with key attributes required for each position.
- Automatic Candidate Ranking - ijob ranking reflects the degree to which the candidate matches the position criteria compared to other qualified candidates.
- Instant Workflow - ijob automatically and instantly notifies hiring managers and HR personnel when a qualified candidate registers.
- Predictions and Metrics - Statistical metrics generated assist in predicting which candidates will be most successful and bring the most value to the enterprise.

MacNeal Health Network runs its LAWSON INSIGHT II solutions on a Compaq server with a Windows NT platform.

Lawson Software, a \$270 million provider of Self-Evident Applications(TM) (SEA) for e-business, offers role-based Web solutions for financials, human resources, procurement, supply chain and performance management. With 2,800 mid- to large-sized corporate customers, Lawson has distinguished itself competitively through a unique blend of feature-rich customer solutions, technology innovation and user-friendly support. Lawson Software has been acclaimed by technology analysts for its innovative and unique use of leading-edge technologies, like Self-Evident Applications(TM) (SEA) on the Web, and Drill Around(TM) for integrated, cross-application data access.

Red Herring magazine names Lawson "the strongest private ERP company" and lists Lawson among the world's top 50 private companies. The Information Technology Association of America asserts Lawson is the first to be certified for Year 2000 compliance. Says the Meta Group, "Lawson gives its customers quantified savings by aiming their technology at saving corporations on overhead...a rare thing in the client/server world." Offering LAWSON INSIGHT(R) II for UNIX, NT and AS/400 platforms, Lawson has 28 offices and affiliates serving 36 countries worldwide and a 96 percent client retention over five years. The company is headquartered in St. Paul and London. Additional information about Lawson Software is available on the company's Web site, <http://www.lawson.com>, or by calling (800) 477-1357, ext. 100.

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*considered***A KNOWLEDGE-BASED REPRESENTATION OF MUTATION FOR CREATIVE DESIGN**

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Abstract: One important characteristic and an essential element of design is that it is a creative act, as the purpose of design is to improve the existing solutions to old problems using new technologies and find solutions to new problems that have not been encountered before. Computers have proven to be powerful tools in removing from the designers' shoulders the burdens of processing and managing large amounts of design information. However, their potential in assisting designers in creative problem solving has not been adequately explored.

In this document, a study of the potential of using computers to support human designers' creativity is reported. A model for creative engineering design based on a network-based design prototype representation and a mixed mutation and analogy technique has been developed. The model distinguishes between a representation of domain-dependent design knowledge and domain independent mutation operators. These mutation operators manipulate the representation based on syntactic information to produce or suggest new design solutions that are not implied by the existing design knowledge. This model extends the representation of design prototypes beyond a parametric expression of function, performance, behavior, and structure to include an explicit representation of the relationships between parameters within a prototype. The categorization of design attributes and the explicit representation of the relations between design attributes are the two most important aspects of the network-based prototype representation and can be used to support creative design.

The model is illustrated using two particular mutation operators called the SCALE operator and the COMBINE operator. In order to produce new design solutions, the SCALE operator mutates the basic structure of a given failed solution by introducing a radical change to an attribute's value. The COMBINE operator utilizes both mutation and analogical reasoning to produce creative design ideas. A failed design solution is repaired by introducing into the failed solution the structure, thus the behaviors and functions, of another prototype. It uses a partial matching technique to identify the useful prototypes based on matching criteria represented as graphs. New solutions are generated by graph manipulation, where the graphs represent parts of a dependency network of a prototype. Both mutation operators produce design solutions using only the information of the relations, functional categories and syntactic description of attributes of prototypes and therefore are domain independent operators. The model has been tested in the domain of structural system design for buildings but has the potential to be extended to other engineering design domains.

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